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THE COMPARATIVE VALUES OF COTTONSEED, COTTONSEED MEAL AND CORN, AS SHOWN BY CHEMICAL ANALYSES

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It is estimated that the cotton crop this year will amount to 15,000,000 bales, yielding about 6,680,000 tons of seed. Probably there will be 2,000,000 tons of cottonseed meal manufactured during the season. Last year about four hundred thousand tons were exported. Under existing conditions it is not to be expected that anything like this quantity will be sent to Europe this year, and with a much larger crop of cotton it is safe to assume that the amount of cottonseed meal manufactured in the United States this year will be 500,000 tons more than last year. This condition has already caused a substantial drop in the price of cottonseed byproducts. Cottonseed meal can now be bought at prices ranging from \$20.00 to \$24.00 a ton, instead of \$27.00 to \$31.00 obtained last year. Hulls now sell at from \$4.50 to \$5.50 a ton against \$7.00 to \$9.00 last year. These prices are attracting attention and offer an exceptional opportunity to the feeder.

Numerous inquiries have been received by the Oklahoma Agricultural Experiment Station asking for information about the several cottonseed products used in feeding, and in answer to these inquiries this circular has been prepared. To show the proper value of these feeds it is necessary to know their chemical composition, also how they compare with other feeds. It is a well known fact that composition or quality has very little to do with the selling price of a feed. The Chemistry Department of the Oklahoma Experiment Station has been studying the various methods for the classification of feeds in an effort to determine a basis for judging different feeds. The details of a proposed system have been formulated and will be briefly shown in outline as applied to a comparison of raw cottonseed and cottonseed meal. Before presenting this outline the most important technical terms will be explained.

Protein, considered by many to be the most important constituent of a feed, is composed of carbon, hydrogen, oxygen, and often sulphur and phosphorus. In most feeds the protein contains 16% nitrogen. Protein is essential to the life of an animal. It is a flesh-former, entering into the composition of muscle, hair, horn, hoof and digestive organs and tissues. Protein helps to form blood and milk, and to give vigor and activity to the animal. The energy value or heat producing power of protein is approximately 1.25 times that of carbohydrates.

The carbohydrates are substances composed of carbon, hydrogen and oxygen. Sugar, starch, glucose and vegetable gums are examples of carbo-

nitrogen

hydrates. In the statement of a feed analysis it is the practice to divide the carbohydrates into crude fiber and nitrogen-free extract. Crude fiber which represents the woody part or framework of a plant, is not soluble in the ordinary liquids. It is principally cellulose, a good example of which is lint cotton containing over 95% cellulose or pure fiber. The portion reported as nitrogen-free extract is more soluble than the fiber, because it includes the sugars and the starches. The nitrogen-free extract is high in most grains on account of their large starch content. The total carbohydrates in any feed analysis may be obtained by adding together the amounts of crude fiber and nitrogen-free extract.

The fats (or oil) and carbohydrates are heat producers and serve to keep the animal warm. They also form animal fat, but they do not form tissues in the body. The fats have an energy value 2.25 times that of carbohydrates.

The analyses, which were selected at random from a large number examined in this department, shown in the table indicate the quality of the cottonseed meal manufactured in Oklahoma:

Analyses of Oklahoma Cottonseed Meals

Water	7.98	7.33	7.97	10.11	7.47	7.98	8.04
Ash	4.95	4.97	5.38	5.25	5.38	5.09	5.17
Protein	45.31	43.69	42.81	42.19	40.81	47.62	39.94
Crude fiber	7.40	10.90	11.24	12.83	13.21	6.69	10.47
Nitrogen-free extract.....	25.74	25.12	22.57	22.22	25.96	25.33	27.38
Fat	8.64	8.00	10.03	7.40	7.17	7.29	9.00

Cottonseed hulls are extensively used in feeding in the place of hay and other fillers. In fact, good hulls will resemble prairie hay in feeding value, as is shown in the following table:

	Prairie Hay.	Cottonseed Hulls.
Water	8.12	11.1
Ash	7.67	2.8
Protein	4.34	4.2
Nitrogen-free extract	42.66	33.4
Crude fiber	35.06	46.3
Fat	2.14	2.2

Several formulas have been suggested by which to judge feeds from a money standpoint, but in most cases the protein has been the only constituent considered. It is true that many authorities place protein above all other ingredients in importance. Fat ranks next to protein and has 2.25 times the fuel value, or energy equivalent, of the carbohydrates. To a great extent fat serves the same purpose of carbohydrates and hence worth 2.25 times as much.

In central Oklahoma protein is worth 3.2 cents a pound as a fertilizer. However, the digestible protein is the part valued in a feed, and the results of many analyses and tests show that the average digestibility of protein is 77%; making the cost 4.1 cents a pound for digestible protein. Corn is the cheapest source of carbohydrates, and at \$30.00 a ton the digestible carbohydrates are worth 1.6 cents a pound. For fat the value becomes 3.6 cents a pound ($1.6 \times 2.25 = 3.6$). If corn is worth \$30.00 a ton and the above prices are applied to cottonseed meal containing 42.3% protein, of which 37.2% is digestible; carbohydrates 29.2%, 18% digestible; and fat 8%, 7.4% digestible, the value of the meal becomes \$41.27 a ton.

Raw cottonseed usually contains protein 18.4%, or 12.5% digestible protein; carbohydrates 48%, 30% digestible; and fat 20%, 18.3% digestible. On a basis of this analysis the raw cottonseed is worth \$32.30 a ton.

The calculations may be tabulated as indicated in the tables below:

Value of Raw Cottonseed

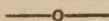
Digestible Substance.	Value a Pound, Cents.	Digestible Amount in 100 Pounds.	Value of Digestible Substance in 1 Ton.
Protein	4.1	12.5	$12.5 \times .041 \times 20 =$ \$10.25
Carbohydrates	1.6	30.0	$30 \times .061 \times 20 =$ 9.60
Fat	3.6	17.3	$17.3 \times .036 \times 20 =$ 12.45
			Total \$32.30

Value of Cottonseed Meal

Digestible Substance.	Value a Pound, Cents.	Digestible Amount in 100 Pounds.	Value of Digestible Substance in 1 Ton.
Protein	4.1	37.2	$37.2 \times .041 \times 20 =$ \$30.50
Carbohydrates	1.6	17.0	$17.0 \times .016 \times 20 =$ 5.44
Fat	3.6	7.4	$7.4 \times .036 \times 20 =$ 5.33
			Total \$41.27

On a basis of cottonseed meal selling at \$30.00 a ton, the raw cottonseed has a feeding value of \$23.40. To obtain the value of the cottonseed multiply the price of the meal by 0.7826. In other words, the feeding value of the cottonseed is equivalent to 78% of the cottonseed meal.

The protein in raw cottonseed is digested but approximately one-third so well as that in the meal, but there is little difference in the digestibility of the fat. Raw cottonseed does not make a good feed unless mixed with a dry cereal, such as kafir, feterita or milo.



CATTLE FEEDING RATIONS

The following rations are calculated on the basis of 1,000 pounds live weight:

Raw Cottonseed

1. Winter Maintenance—

- (a) Cottonseed, 5 pounds
Sorghum silage, 30 pounds, or 10 to 12 pounds fodder
Wheat or oat straw, 5 or 6 pounds
- (b) Cottonseed, 3 pounds
Kafir, 2 pounds
Sorghum silage, 30 pounds, or 10 to 12 pounds fodder
Wheat or oat straw, 5 or 6 pounds

2. Growing Young Cattle—

- Cottonseed, 6 pounds
Kafir, 3 pounds
Sorghum silage, 30 pounds, or 10 to 12 pounds fodder
Alfalfa hay, 5 pounds

3. Fattening Steers—

Cottonseed, 7 pounds

Kafir, 6 pounds

Sorghum silage, 25 to 30 pounds, or 10 to 12 pounds fodder

Alfalfa hay, 5 pounds

4. Dairy Cows—1,000 pounds live weight, giving 10 to 12 pounds milk daily—

Cottonseed, 5 pounds

Kafir, 3 pounds

Mill run, 2 to 5 pounds, depending on the amount of milk given

Sorghum silage, 35 pounds, or 12 to 15 pounds fodder

Alfalfa, 10 pounds

These daily rations are only approximate and will need to be modified according to the appetite of the animal. Sorghum silage could be replaced by silage made from corn, kafir, milo or feterita, and it would not be necessary to feed quite so much of silage made from these crops as from sorghum. If silage is not available, the fodders of any of these crops could be substituted. From 35% to 40% of the weight of the silage should be the weight of fodder in the ration. Any of the grains similar to kafir could be fed in the place of kafir.

The following rations are advised with the feeding of cottonseed meal:

Cottonseed Meal

1. Fattening Steers—

Cottonseed meal, 6 pounds

Kafir, 5 pounds

Sorghum silage, 25 to 30 pounds, or 10 to 12 pounds fodder

Alfalfa hay, 5 pounds

2. Dairy Cows—

Cottonseed meal, 3 pounds

Kafir, 3 pounds

Mill run, 2 to 5 pounds, depending on the amount of milk given

Sorghum silage, 35 pounds, or 12 to 15 pounds fodder

Alfalfa hay, 10 pounds

In addition to feeding value, the fertilizing value of crushed cottonseed and cottonseed meal is very high, so high, indeed, that often the plant food present is worth more than it now costs. When it is remembered that from 80% to 90% of this fertilizing value remains in the manure the opportunities for profit that its use offers become even more obvious. In other words when the enrichment of the land is considered, it appears that the feeding of cottonseed and cottonseed meal to cattle costs only from 10% to 20% of the market price.

No other form of concentrated feed is liable to prove as profitable as cottonseed meal this year. In Oklahoma the feeders have an opportunity to get meal at a lower price than at any other time in the past. Combined with kafir, feterita and silage they should be able to secure gains very cheaply and, with the high prices for finished cattle, make good profits.

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